

The Computer as a Part of the Network Ensemble: Georg Hajdu's *Ivresse '84*

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After a short introduction to the history of computer network music, an analysis of Georg Hajdu's composition *Ivresse '84* from 2007 using *quintet.net* for network ensemble is presented. Based on the analysis and interpreting Hajdu's homage to Cage, the paper closes with thoughts on the impact of more recent technological developments in computer network music and the mutual influence between them and aspects of timing.

Even though computer networks – hardwired or via Wi-Fi – are omnipresent nowadays, music explicitly dedicated to performances in computer networks is a niche in computer music. The history of computer network music is not well reviewed but closely connected to the technological developments. A pioneer work that has been discussed in the literature is John Cage's *Imaginary Landscape No. 4* from 1951, which uses an analog music network (Weinberg 2005: 24; Carot et al. 2007: 131). Starting with the more recent technological developments of computer networks in the early 1990's, several systems for computer network music occur (Kapur et al. 2005: 209 et sqq.). According to Carot, “[m]ost projects undertaken in the field of real time high quality networked music performance took place around and after 2000 and went very quiet afterwards.” (Carot et al. 2007: 132) One of the systems is *quintet.net*, which was developed in 1999 by Georg Hajdu. This environment allows interactive multimedia performances for up to five connected computers, which can be guided by a conductor-computer. In 2007, around the time when Carot notices a new interest in computer network music (Carot et al. 2007: 132), Hajdu composes *Ivresse '84* for laptop quartet and violin using *quintet.net*. The composition is based on John Cage's first *Freeman etude* for violin solo and on text fragments commenting Négyesy's premiere of the first four books of the *Freeman Etudes*.¹ Taking Cage as reference, Hajdu claims that he is “interested in the moment when modernism and its iconoclastic attitude had lost its impact — a moment representing a paradigmatic change in history and society.” (Hajdu 2011)

Now, in 2013, the network's uncontrollable latency decreased to a minimum and therefore lost its impact on the composition's performance. Nevertheless, the old compositional assumptions as well as their implementation in the performances, e. g. models for time management, which dealt with the latency, still exist within the compositions. This opens not only questions about the performance of these works, it also provides new possibilities for computer network music.

Computer network music

The history of computer network music has been influenced by diverse criteria such as technology, philosophy and also social aspects (Schroeder et al. 2007). An early center for experimenting and developing computer network music projects was the Bay Area in California. Starting in the late 70s, the concept of making music with computers, which are connected in networks was strongly influenced by the idea of a network society (Breitweiser 2013: 8), and based on as well as mutually influenced by new inventions in information technology; in particular, the development of microcomputers in 1973 with the corresponding software tools, and the extension of internet technology (Iacofano 1985; Hauben 2004).

The first to use the term “network computer music” were members of “[t]he League of Automatic Music Composers, a group of musicians from Oakland, California, that included John Bischoff, Jim Horton, and Rich Gold (later replaced by Tim Perkis) [...]” (Weinberg 2005: 25), who started connecting Commodore KIM-1 computers in 1976. This group continued with different line-ups until 1983 (ibidem). In 1986, John Bischoff and Tim Perkis started a new performance called *the Hub*, in which they used “microcomputer as a mailbox to post data used in controlling their individual music systems, which was then accessible to the other player” (Brown / Bishoff 2002). Joined by “Chris Brown, Scot Gresham-Lancaster, Mark Trayle, and Phil Stone [...]” The Hub debuted on June 6, 1987 in the first performance of remotely networked computer music.” (Breitweiser 2013: 10) In 1990, the Hub started not only sending text messages but also using MIDI (Brown / Bishoff 2002). Since the mid-1990s, several groups experimenting with musicians connected via telephone line or low-level internet are documented (Kapur 2005: 209; Carot 2007: 131).

One problem for a historic overview is that the early systems were often designed for certain projects and have not been developed further as a complete platform. Hajdu, for examples, lists in his paper from 2005 eight other

internet music projects (Hajdu 2005). Because of their very different goals and documentation situation, the projects can hardly be classified or compared. Of all mentioned systems, only *Transjam*, assumably a fusion project of Phil Burke and Chris Brown's Eternal Network Music seems to be currently still active (Hajdu 2005; Föllmer 2005: 108). Chris Chafe's *SoundWire* Project became a research group at CCRMA, where the audio network performance system *JackTrip* was developed. The last project of Miller Puckette's *Global Visual Music* is dated to 2000, the last one using *Cathedral* by William Duckworth was documented in 2007.² Föllmer also presents some of these systems, but classifies them along again other criteria, so is *The Eternal Network Music Site* grouped in 'Hypermusik', whereas *FMOL* and *quintet.net* share the group 'Instrument'. *The League of Automatic Music Composers* as well as *The Hub* are classified 'Performance' (Föllmer 2005: 108, 136-137, 148-154).

In 2007, Carot and his team present four main networked music performance systems: *Soundjack* and *eJamming* as a “realistic jam approach” which have a consequent real-time approach and try to work with as little latency as possible, and *Ninjam* and *quintet.net* as a “latency accepting approach”, which “consider the internet as a decentralized and space independent medium and thus connecting globally, network delays of more than 200ms are common and perfectly acceptable.” (Carot 2007: 133)

Georg Hajdu's *Ivresse '84*

Ivresse '84 for solo violin and network ensemble premiered on September 6th 2007. It was played by the violinist János Négyesy and the *European Bridges Ensemble*. The concert took place at the *Global Village Music Festival* in Budapest. The composition is based on *quintet.net* (Hajdu 2011a).

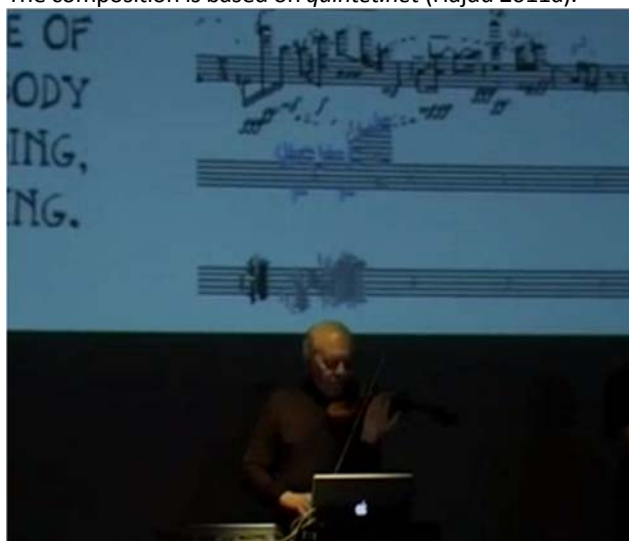


Figure 1. In 2007, the score appearing on Négyesy's client was displayed next to the text excerpts of the interview, so the audience was able to follow his real-time interpretation (Screenshot taken from the performance *Ivresse '84* (E-B-E 2008).

quintet.net

quintet.net is a system for performing music with networked computers. Hajdu started developing *quintet.net* in 1999. Between 1990 and 1994 he completed his PhD in composition at the music department of the University of California Berkeley, where he also closely collaborated with the *Center for New Music and Technology CNMAT*. Reflecting on Marshall McLuhan and his idea from 1964 of the world as a global village, as well as referring especially to the history of *the Hub*, Hajdu directly links his idea that led to the development of *quintet.net* with the tradition of computer network music in the Bay Area (Hajdu 2005; 2011b).

The environment of *quintet.net* is designed for internet as well as local network performances. It consists of five components titled “conductor”, “server”, “client”, “listener” and “viewer add-on”. This creates a system like “a quintet under the control of a conductor, as a metaphor for musicians interacting over a network.” (Hajdu 2005) The “conductor's” device, used by the conductor or director of the performance, requires a *.cond* file, which defines the timeline and contains text files called “score”. This file is obligatory for using *quintet.net*. On the “conductor”, the user can, like on every “client”, select sounds, tunings, processes and filters. He can communicate with the other players through text messages which appear in their “clients” command lines. The “server” contains the hub – the central node of the data network. It has, in addition to managing data streams, also musical options like adding effect algorithms to the incoming stream of music, which can completely change the sound output. The “client” signifies the component for the musicians. It has six so called “identities”: five single ones – one for each of the five laptop-players –, and a “listener”, which gives the possibility of following a performance without interacting. Every player's “client” has an input unit, a sound synthesis unit and a real-time notation unit. A modified MIDI protocol is used to control the sound synthesis unit, which can be e.g. the internal sampler or VST plug-ins. The “clients” can communicate via chat window. The “viewer add-on” is designed as a visual output and provides an additional visual layer.

quintet.net permits partly or completely defined compositions, conducted as well as interactive or improvised performances, and real-time score generation. The system provides three levels of interaction: the user of the “conductor” can stream messages, presets and instructions to the “clients” and also trigger audio and video samples. The players of the “clients” can communicate via “Datagram Protocol” and interact by sharing their control data on the “server”. Lastly, there is the option to integrate the audience by inviting them to send data to the “conductor's” device (whose user then can react to it) and influence the final result. The output of the performance system can either be live audio-visual or net-

work streaming. Therefore, each performance produces one global and five local versions. For audio output, the formats stereo and 5.1 are provided. Since 2003, there exists a special *Composition Development Kit* for *quintet.net*, providing additional editors for sound shaping and score writing (Hajdu 2005; 2006).

Ivresse '84

Hajdu titles the composition in reference to Ivrea, the city where Négyesy played the premiere of the first two books of the *Freeman Etudes*. The same time, he also references the meaning of the French word “ivresse” – “drunken”–, which, as Hajdu states, fits well to the incidences at the premiere of the etudes (Hajdu 2013). The commission by violinist János Négyesy, who closely worked together with Cage when premiering the first two books of Cage's *Freeman Etudes* in 1984, went well together with Hajdu's interest in Cage's work, out of which Hajdu performed Cage's *Five* in an arrangement for *quintet.net* in 2001, and launched a version of *Radio Music* in 2008.³ This helps to understand the time structure of *Ivresse '84* as it was developed in close relationship to Cages idea of structuring time. Apart from descriptions published by Hajdu, and a video of a rehearsal in Budapest in 2007, there exist the notated part of *Ivresse '84*, which include Hajdu's transcribed score of the first *Freeman Etude*, an event list, a screenshot of a Max patch called “freeman player” and text panels with Négyesy's interview with Hajdu. Furthermore, there took place an informal correspondences with Hajdu and members of the *European Bridge Ensemble* (Hajdu 2007; 2013; E-B-E 2008).

The composition consists of four different elements and technically uses four components of *quintet.net*: one “client” for the solo violin, four “clients” for the four laptop-players, the “conductor” device for Hajdu, the “server” as central hub, and the “viewer add-on” for live projection. For the violinist, a score is displayed on his “client”. The four laptops, Hajdu calls them “electronic musicians” (Hajdu 2007), react to the soloist's actions in replaying modified audio samples taken from Négyesy's CD recording of the first *Freeman etude*. In addition, the players receive instructions from the “conductor”, which emerge on their “clients” screens.

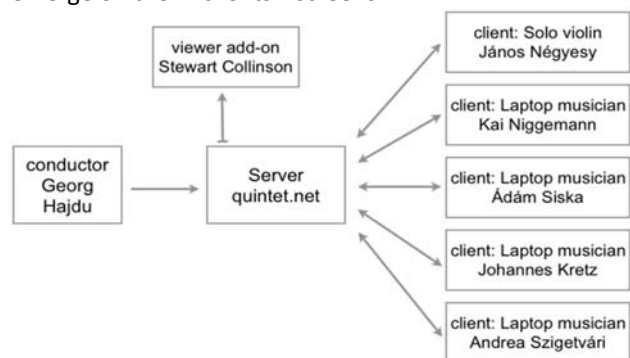


Figure 2. Structure of *Ivresse '84* (Premiere in 2007)

The score

The basic material for *Ivresse '84* derives from the first *Freeman etude* and the first four minutes of an interview, Hajdu held with Négyesy about playing the etudes and collaborating with Cage. Hajdu's goal was to create “a crossover between a documentary and a real-time interactive composition for violin and four electronic musicians.” (Hajdu 2007) Therefore, the first *Freeman etude* was transcribed. Hajdu arranged the space notation of Cage in 2/4 time bars, and divided the transcription into 20 sections that were rearranged along the interview's plot. Each section was altered based on stochastic processes. The new structured score was sent to the violinist step-by-step, the new score appeared continuously in the staves, being read from left to right side in time. The old score disappeared. Négyesy had to sight read the score appearing on his client and interpret it in real time (Hajdu 2007).

The conductor

The performance is guided by the conductor using a GUI for Jazz Mutant's LEMUR as control surface.

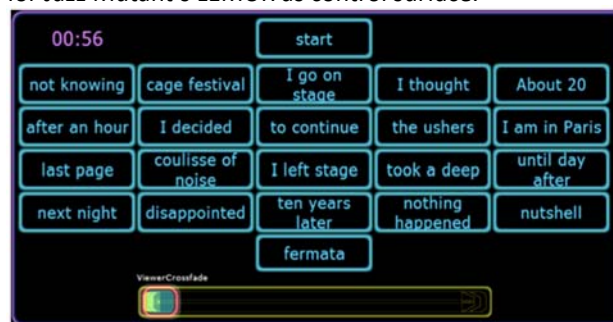


Figure 3. Screen shot LEMUR interface used by the conductor to control the performance of *Ivresse '84* (Hajdu 2007)

The conductor selects and starts the sections. Once activated, a section sends the implied instructions and settings to all components of the environment, including projection and audio playback. Each section contains an audio file of interview fragments with Négyesy that starts, when the section is chosen. In parallel to the audio, a video projector displays the same statement in written form, using the font “John Cage Handwriting”⁴.

I GO ON STAGE, TAKE
A BOW, PLAY TWO
NOTES AND ALREADY
A DOZEN PEOPLE WERE
SCREAMING "BRAVO
MAESTRO."

Figure 4. Screenshot performance *Ivresse '84* (E-B-E 2008)

The performance – a question of timing

Ivresse '84 includes composed elements as well as an 'improvisational' space. The conductor is guided by the narrative of the interview, but free to change the timing of the sections while the sections themselves remain composed. Due to the technical conditions in 2007, Hajdu faced challenges concerning the synchronization: one issue was to make sure that all clients received the conductor's instructions at the same time, because the network latency created an inconsistent delay in sending or receiving instructions and starting sounds. Hajdu proposed three strategies: the performers guide the timing, and the conductor sends instructions on their page turn; the performers turn the pages via pedal and the conductor follows; the performers use a metronome. In the last two strategies, the conductor would only influence the overall impression (Hajdu 2007). Even though Hajdu invents strategies to solve the timing issue and Carot classifies the system of *quintet.net* as a “latency-accepting approach” (Carot 2007: 133), the network speed becomes an important part of the interpretation and therefore of the performance. For *Ivresse '84*, Hajdu refers to Cage's idea of time brackets in two steps. At first, he maps the freely notated time slots of the first *Freeman etude* into a measured score; then he asks the soloist to interpret the score in a non-synchronized performance. Hajdu brings together two ideas of dealing with time. In the *Freeman Etudes*, Cage had a very strict time notation, which is set by space – the total length of the notation equivalent to the assumed length of three minutes for each etude (Vogels 2007). For *quintet.net*, Hajdu proposes an abstract synchronization, which is inspired by Cage's Number Pieces. Instead of giving an exact musical timing, the events should happen within time brackets on a fixed time line (Hajdu 2005). Therefore, *Ivresse '84* contains two ideas of Cagean time-handling, the non-written but strict time schedule of the etudes and the notated but more open time bracket synchronization of *quintet.net*. The computer network latency influences the final timing of an event within the time brackets. In a very figurative way, time-relevant decisions therefore could be seen as partly conceded to the computer network.

New possibilities, new challenges

One reason for the development of a more open timing principle for *quintet.net* was Hajdu's synchronization problem. The set-up of the computer network itself influences the timing. The problem of latency in working with computer networks is well-known and as inevitable as challenging. Since 2007, network technology has been developed further. Timing and latency concerning audio data is still an important issue, highlighted for example in

Flavio Schiavoni's paper on the speed of different network transport protocols presented at ICMC 2013 (Schiavoni 2013). Hajdu updated *quintet.net* constantly since he started to develop it in 1999. If *Ivresse '84* was performed on an almost latency free network, the instructions sent by the conductor would be synchronized – and would start working immediately. The computer network would hardly influence the timing of events within the time brackets, the responsibility of the time schedule would completely be handed to the conductor and the players. In an abstract way, the (former) latency of the network could be seen as an implemented stochastic algorithm as it had a predictable output range but in detail produced unpredictable results. Eventually, to keep the initial idea, artificial latency can be implemented in the network. Then, again, the composer is in charge of the timing as he decides on the implemented algorithms which cause the timing lags. Also, in almost latency-free networks, score-based approaches are still very common (Canning 2012), but it also encourages new approaches to computer network music, such as the design of network instruments, e.g. *the loop* (Davis et al. 2012). These last developments are based on almost latency-free systems in order to provide a synchronization of interface and sound source. The importance of the internet concerning computer network music grows, but still seems to be small; latency issues are an important but not limiting factor.

Nevertheless, the more the significant singularities of the 'computer network' system disappear, the more interesting it will be to follow the future of 'computer network music'. The challenge of timing and latency issues will, at least for some more time, remain an important part of these systems, especially with long distance networks or wireless systems.

Ivresse '84 is at the moment not running on the current version of *quintet.net* (Hajdu 2013). It will be interesting what an adaption will look like.

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¹ The *Freeman Etudes* were developed by John Cage 1977-1990 (Griffiths, Paul. Cage, John (Milton). In: *Oxford Music Online*. Oxford University Press. Web. Retrieved from <http://www.oxfordmusiconline.com/subscriber/article/opr/t114/e1077> on December 10, 2013.). 1977-1980 books 1 and 2, 1989-1990, books 3 and 4. The etudes were commissioned by Paul Zukofsky and dedicated to Betty Freeman. When Zukofsky mentioned in 1980, that the etudes were unplayable, Cage stopped composing after etude 18, even though the composition was structured for 32 etudes (Vogels 2007). In 1984, János Négysesy played the premiere of the first two books in Ivrea, Italy (Hajdu 2007). Irvin Arditti replayed the etudes in 1989 at Huddersfield Contemporary Music Festival. He also played the first performance of all etude in 1991 in Zurich (Reynolds, R. CAGE ... FREEMAN ... ARDITTI. Retrieved from <http://www.johncage2012.com/features/arditti.html> on December 11, 2013).

² The active projects and research groups document their work on their websites (Retrieved from <http://www.transjam.com/eternal/eternalclient.html> and <https://ccrma.stanford.edu/groups/sundwire/software/> on December 10, 2013.). Also existing are the websites of the *Global Visual Music* and *Cathedral* (Retrieved from <http://www.visualmusic.org/gvm.htm> and from <http://cathedral.monroestreet.com/index.php> on December 10, 2013.). The other projects mentioned by Hajdu are no longer in progress. *FMOL* by Sergi Jordà ended in 2001 (retrieved from <http://www.dtic.upf.edu/~sergi/?mediaprojects/fmol/> on December 10, 2013), *Telemusic* by Randall Packer was a single project in 2000 (retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.99.6760&rep=rep1&type=pdf> on December 10, 2013), and for *SoundColors* by Mara Helmuth, no documentation could be found.

³ List of concerts performed with quintet.net. Retrieved from <http://quintetnet.hfmt-hamburg.de/wiki/pages/0954u4Z9/Pieces.html> on December 11, 2013.

⁴ The font is based on the handwriting of Cage and was produced by *The Museum of Contemporary Art* in Los Angeles and the *John Cage Trust*. It includes 52 graphics. Retrieved from <http://www.p22.com/products/cage.html> on January 16, 2011.

[Abstract in Korean | 국문 요약]

네트워크 앙상블의 일부로서의 컴퓨터: 게오르크 하이두Georg Hajdu의 《도취 '84Ivresse '84》

미리암 아커만

컴퓨터 네트워크 음악의 역사를 간단히 소개한 후, 퀸텟.넷quintet.net을 사용한 게오르크 하이두의 네트워크 앙상블을 위한 2007년 작품 《도취 '84》를 분석한다. 이 논문은 하이두의 《케이지를 향한 경의Homage to Cage》를 분석하고 해석한 것을 바탕으로 하며, 컴퓨터 네트워크 음악에서 최근의 기술 발전의 의의와 이러한 발전과 타이밍 측면 사이의 상호 영향력에 대한 담론으로 마무리된다.